Orthogonality

Inner Product

$$\langle f,g\rangle = \int_a^b f(t)g(t)\,dt$$

- orthogonal if $\langle f,g\rangle = 0$

Sine and Cosine Identities

$$\int_0^T \sin(2\pi n t/T)\,dt = 0$$

$$\int_0^T \cos(2\pi n t/T)\,dt = \begin{cases} 0, & n \neq 0 \\ T, & n = 0 \end{cases}$$

$$\int_0^T \sin(2\pi m t/T)\cos(2\pi n t/T)\,dt = 0$$

$$\int_0^T \sin(2\pi m t/T)\sin(2\pi n t/T)\,dt = \begin{cases} 0, & m \neq n \\ T/2, & m = n \end{cases}$$

$$\int_0^T \cos(2\pi m t/T)\cos(2\pi n t/T)\,dt = \begin{cases} 0, & m \neq n \\ T/2, & m = n \end{cases}$$

- Significance ?
  - If $\langle f,g\rangle = 0 \therefore f$ & g are distinct from one another and orthogonal.
  - If $\langle f,g\rangle = 1 \therefore f$ & g have silimarities between them

Similarity Coefficient

$$C = \frac{\langle f,g\rangle}{\langle g,g\rangle}$$